C H A P T E R

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Emotion Categorization

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O U T L I N E

Abstract

The discussion of whether emotions are categorical in nature has loomed large ever since Darwin (1872) posited an evolutionary base for human emotion expressions. This discussion has traditionally conflated two issues. First, is emotion elicitation categorical, such that different emotions are associated with qualitatively different neural substrates, expressive reactions, action tendencies, and feeling states resulting in discrete emotional states? And second, is the perception of emotion expressions categorical, resulting in the use of discrete emotion labels?

These questions have been traditionally conflated because research on the universal use of emotion labels for facial expressions became a cornerstone for the assumption of discrete emotions. In this chapter I present an overview of this discussion that concludes a middle stance in which some processes are dimensional and others categorical. Importantly, from a functional perspective the use of emotion categories by perceivers provides a useful base for communicating about emotions and for drawing inferences from the emotional behavior of others.

Ever since Charles Darwin wrote his seminal and highly influential book, *On the Expression of the Emotions in Man and Animals* (1872/1965), the question of whether emotions are categorical or dimensional in nature has been discussed (at times passionately) in psychology and philosophy. This question can be divided into two aspects that have often been conflated. First, is emotion elicitation categorical, such that different emotions are associated with qualitatively different neural substrates, expressive reactions, action tendencies, and feeling states? And second, is the perception of emotion expressions categorical?

On one side of this discussion are researchers who maintain strongly that emotions are categorical in nature (e.g., Ekman & Cordaro, 2011; Ekman & Matsumoto, 2011; Izard, 2007; Panksepp, 1998, 2011) as well as theoretical positions that strongly imply this notion (Cosmides & Tooby, 2000). On the other are those who just as strongly maintain that emotions are dimensional and best described with the notions of valence, intensity, etc. (Barrett, 2006a, 2006b; Russell, 2003) as well as theoretical positions that conflict with the basic rationale for categorical emotions (Lutz & White, 1986; Wierzbicka, 1992).

The two issues are conflated in theory and research because one of the main battlegrounds in this debate has been the study of facial expressions of emotions. As such, the two—epistemologically independent—questions raised above, have been conflated in much of the literature such that evidence for the universality of categorical emotion expressions as assessed by emotion perception studies has been one main argument in favor of the view that emotions are in reality categorical. Conversely, empirical evidence that this is not the case has been advanced as a main argument in favor of a dimensional view.

Again, however, it is important to note, that these two issues are not necessarily linked. First, color perception is an example for the categorical perception of a stimulus that varies on a dimension (wavelength). Thus, how a stimulus is perceived is not necessarily informative of its underlying or fundamental nature.

Second, much of the literature in this domain focuses on the even more specific question of whether emotions are natural kinds. As I will outline below, emotions can be perceived as categorical without being natural kinds (see Izard, 2007). In fact, even proponents of the view that emotions are indeed natural kinds (e.g., Charland, 2002; Izard, 2007) do so only for a subset of emotions. In this view, the real argument is whether there is at least a subset of emotions that are natural kinds.

Third, just as colors can be dimensional and categorical depending on whether we are asking how they are perceived or the underlying physical reality that gives rise to them, so can emotions be conceived of as either categorical or dimensional depending on the level of analysis we are engaged in. As shown by Osgood, Suci, and

Tannenbaum (1964), basically any set of concepts (e.g., a list of animals; Osgood, 1952) can be described at some level of abstraction in terms of valence and arousal (and often power).

In what follows, I will summarize aspects of the current and past debates on the nature of emotions. I will first present the ongoing discussion regarding whether emotions are fundamentally categorical or dimensional—i.e., the production side of emotions; and then on the perception side—the equally ongoing and contentious discussion of whether emotions are perceived as categorical, dimensional, or both.

5.1 EMOTION PRODUCTION

Many emotion theories explicitly conceive of emotions as fundamentally categorical. This is the case for all theories that are based on evolutionary premises. Darwin (1872/1965) was the first to propose that emotions have evolved to solve specific adaptive problems (cf. Tooby & Cosmides, 1990). The basic notion is that these adaptive problems (nurturing the young, finding food and sexual partners, defending from attack, etc.) are common to all species which have emotions (which these are is again a topic for discussion) (Panksepp, 2011) and that specific emotions arose as problem solving mechanisms (Frijda, 1986; Scherer, 1987). This notion then typically results in a list of emotions, which are viewed as "fundamental." Panksepp (1998) refers to these as "blue ribbon" emotions. Often the term "basic" emotions (Ekman, 1972) is used. Izard (2007) distinguishes between basic emotions and emotion schemas. A precise definition of what makes an emotion basic is lacking—and hence a consensual list of these emotions has not yet emerged (Ortony & Turner, 1990; Turner & Ortony, 1992).

The assumption that specific emotions are associated with specific challenges implies that each emotion has specific properties that distinguish it qualitatively from other emotions in a definable way. Current emotion theories which make this point are, e.g., Ekman's Neurocultural theory (Ekman, 1972; Ekman & Friesen, 1971), most appraisal theories (e.g., Frijda, 1986; Roseman, 1991; Scherer, 1987; Smith & Ellsworth, 1985), but also neuroscience approaches to emotion, which locate different emotions in distinct neural substrates (e.g., Panksepp, 1998). I will (very) briefly summarize these theories as well as the main points of critique.

Paul Ekman's *Neurocultural Theory* was originally developed with a focus on facial expressions. The theory (Ekman, 1972; Ekman & Friesen, 1971) posits affect programs, which are (neural) mechanisms that trigger emotional responses that are typically quick, complex, organized, and difficult to control. Affect programs are originally hard-wired but then

are individualized through the learning history of the individual (Ekman & Cordaro, 2011). They link the emotions identified as basic (happiness, sadness, fear, disgust, anger, surprise, and possibly contempt) (Ekman & Friesen, 1986) to specific (facial) expressions, physiological reactions, and likely actions. That these hard-wired instructions do not lead to identical expressions in everyone is explained by individual and cultural differences in emotion regulation. Through reevaluation, an initial emotional reaction may also change in culture specific ways.

In the 1980s, several researchers (Frijda, 1986; Oatley & Johnson-Laird, 1987; Ortony, Clore, & Collins, 1988; Roseman, 1984; Scherer, 1987; Smith & Ellsworth, 1985) formulated, relatively independently, the so-called *Appraisal Theories* of emotion. These theories have in common that they posit that emotions are elicited and differentiated through a series of appraisals or evaluations of internal or external stimulus events according to the perceived nature of the event. Although appraisal theories vary with regard to both the number of appraisal categories they include and the exact definition of these categories, there is substantial overlap (Ellsworth & Scherer, 2003). They also have in common that they consider emotions to be adaptations to evolutionary challenges.

A simplified model of the emotion-eliciting process as conceived of by appraisal theories starts with the perception of a change in the environment by the organism (Novelty). This change is evaluated according to whether it is beneficial or harmful for the organism. That is, whether the change is in line with the motivational state of the individual or obstructs the individual's goals. The individuals also evaluate their ability to cope with or adjust to the change. In the case of humans, a further set of evaluations regards the correspondence with the relevant social and personal norms in terms of fairness, justice, and appropriateness. The emotions that result from these appraisal processes are considered to be qualitatively distinct. However, depending on how many categories a given theory assumes and how fine-grained the evaluation of the category is, the number of possible distinct emotions can be in the millions. Obviously some of these emotions have to be very similar to others and, from this theoretical perspective, it is useful to conceive of emotions as families.

Panksepp (1998) approaches the categorical question from a neuroscience perspective. He posits a number of basic emotional systems (seeking, rage, fear, lust, care, panic, play) (Panksepp, 2011) which are common to humans and nonhuman animals and which serve basic adaptive functions. Thus, the panic system functions to ensure that mothers and helpless infants are reunited after separation. The seeking system functions to underpin positive motivation in the search for food and sexual partners. Each system is associated with a specific neural

pathway, and as such, the described emotions are distinct in both function and neural substrate.

In contrast to the emotion theories discussed above are theories that dispense with discrete emotions and instead see emotions as defined by the dimensions of valence and arousal. Thus, Barrett (2006b) and Russell (2003) hold the view that the basic emotion experience is described by core affect. Core affect itself is a neurophysiological state but it is available to consciousness and experienced as feeling good or bad as well as various levels of activation. These two dimensions of valence and arousal then combine with the conceptual knowledge about emotions that people acquire during socialization. Perceptually this is a categorization process, which sorts changes in core affect into an experience of discrete emotions (Russell & Barrett, 1999).

That is, at some level both conceptual act theory (Barrett, 2006b) and core affect theory (Russell, 2003) consider emotions as they are perceived and experienced by humans as categorical. However, these experienced categories are not grounded in anything specific about the emotion such as a neural substrate or an evolutionary challenge, but rather they are grounded in the perceptual processes of the emotor. It is the emotors, or in the case of emotion recognition the perceivers' conceptual knowledge, which is culturally learned and in turn imposes the categories. These dimensional theories do not generalize as seamlessly to animals (and small children) as do appraisal theories and neuroscience approaches to emotion, as one defining element of the emotion needs to be culturally learned (see Hess & Thibault, 2009).

An alternative view focuses on approach and withdrawal as central to the dimensions of emotion (e.g., Carver, Sutton, & Scheier, 2000). Approach and withdrawal are considered to be basic response patterns fundamental to all complex adaptive behavior. As such, these theories generalize readily to nonhuman animals.

5.2 ARE EMOTIONS NATURAL KINDS?

In sum, many emotion theories explicitly assume that emotions are categorical at a fundamental level in that each (basic) emotion differs qualitatively from the others and each is based on different neural substrates or processes. This does not mean that all processes involved are categorical—e.g., appraisals can be considered as continuous in nature (Scherer, 1987).

In contrast are dimensional views such as those proposed by Barrett (2006b) and Russell (2003) that assume that emotions fundamentally vary continuously along the dimensions of valence and arousal and are not related to qualitatively different substrates or processes. In this case,

it remains plausible that (after application of culture specific emotion knowledge) emotions are experienced as categorical.

Thus, some emotion theories assume that emotions are in "essence" categorical, even though the eliciting processes may not be categorical, whereas others assume that emotions are in "essence" dimensional even though they may be experienced as categorical. That is, both classes of theories admit some level of dimensionality and some degree of categorization. This raises problems for the types of evidence that would conclusively resolve this debate.

This difference in the conception of emotions has found an expression in the discussion of whether emotions are natural kinds, i.e., whether emotion categories represent a real structure of the world rather than human-imposed categories. In this view, theories like appraisal theories, the neurocultural theory, and neuroscience approaches are congruent with the notion of natural kinds whereas the categories that emerge from conceptual act theory are not.

In the absence of any consensus as to what empirical evidence for natural kinds would resolve this disagreement, it has been ongoing for some time with ever changing protagonists (for an overview, see Lindquist, Siegel, Quigley, & Barrett, 2013). In fact, Linquist et al. refer in this context to a "100 year war." It should be noted, that discrete emotions as such do not have to be natural kinds. Thus, Izard (2007) explicitly differentiates between basic emotions, which have universality and are in his view natural kinds and emotion schemas, which are discrete but not natural kinds, precisely because their properties differ across individuals and cultures (see also Matsumoto & Hwang, 2012).

However, since the debate of whether emotions are natural kinds subsumes the question of whether (basic) emotions are categorical, it is informative on this issue. The historical overview by Lindquist et al. (2013) begins with Darwin (1872/1965) and notes that at each step of the debate one view won a battle but never the war. The most recent debate pitches neuroscience approaches as proposed by Panksepp and Appraisal Theories on one side against constructionist approaches, in particular Conceptual Act Theory, on the other.

In regard to the latter, Barrett (2006a) summarizes the evidence against emotions as natural kinds on the basis of a number of findings that one would expect if emotions were natural kinds. For example, if emotions were natural kinds then the different measurable aspects of any specific emotion (if properly reliable and valid), should correlate. Indeed Scherer (1987) claims that it is precisely the function of emotions to coordinate the different components of emotion such as physiological response, expressive response, action tendencies, and subjective feeling. To my knowledge, there is no research that has assessed all of these components at the same time. On the other hand,

correlations between components such as expressive behavior or physiological reactions with self-reported emotion have been assessed and a number these studies have found reasonable correlations between self-reported emotions and facial expressions (e.g., Bonanno & Keltner, 1997; Kunz, Mylius, Schepelmann, & Lautenbacher, 2004; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005; for a review see Hwang & Matsumoto, 2016). However, as Barrett (2006a) notes, most of these studies allow for alternative explanations. More importantly in her view, evidence for correlations between facial expressions and self-report tend to be higher when only a positive−negative valence dimension is reported (Lang, Greenwald, Bradley, & Hamm, 1993). One problem with this line of argument is that the two types of findings are based on the use of different stimuli. If the stimuli used to elicit affect are unsuitable for eliciting a specific emotion (e.g., because they elicit mixed emotions or moods), then the result would be a strong positive−negative difference with little internal structure within the positive or the negative domain.

More recently, a metaanalysis (Lench, Flores, & Bench, 2011) addressed the question of whether discrete emotions are associated with a coherent pattern of emotion components. They conclude that behavioral, experiential, and physiological responses tended to covary following elicitation of the discrete emotions of happiness, sadness, anger, and anxiety. They also conclude that valence alone does not capture the variance found well. Valence and arousal models do capture more variance, but still fail to explain the data as well as does a discrete emotion assumption.

Lindquist et al. (2013) criticize this conclusion because the metaanalysis does not show a specific and consistent pattern of responses for all emotion categories. They further argue that even if this could be shown it would then be necessary to also show that these patterns are inborn and inherited.

It should be noted that the theories reviewed above do not presume that all aspects of an emotional reaction are inherited and context independent. From this author's point of view this would in fact be an unreasonable requirement. For example, in response to the same conditioned fear stimulus 16-day-old rats freeze, whereas adolescent 30-day-old rats show flight behavior (Kurtz & Campbell, 1994). The reason being that 16-day-old rats are not yet efficient runners.

Another domain where the question of coherence across various indicators of emotion that has been discussed ever since Cannon's (1927) critique of William James' emotion theory (1884) is whether there are emotion-specific patterns of autonomic system activity—which Cannon denied. Barrett (2006a) notes that there are studies that support specificity, but identifies cautionary concerns (e.g., Larsen, Berntson,

Poehlmann, Ito, & Cacioppo, 2008) related to the wide variance of effects that have been found. Barrett (2006a) further notes the strong evidence for patterning in response to threat and challenge in stress experiments (Quigley, Barrett, & Weinstein, 2002). A more recent meta-analysis (Kreibig, 2010) concludes that there is considerable autonomic nervous system response specificity in emotion but concedes that it is important to consider subtypes of emotion. From her point of view, neither shame and embarrassment nor amusement and happiness are really the same thing when it comes to the action that is required. In essence, this caveat is related to the fact that physiology is not there to allow researchers to measure emotions, but rather to keep the body moving. Hence, in order to observe stable patterns, one has to use a fine-grained approach to defining the specific emotion (and implied action tendency) under consideration.

A third equally contested question is whether there are neural substrates that are identifiable for specific emotions. Barrett (2006a), after comparing two metaanalyses (Anderson, Adams, & Plaut, 2008; Phan, Wager, Taylor, & Liberzon, 2002) which both suggested qualified support for discrete emotion theory, notes a lack of agreement on the specific neural substrates for most emotions, except perhaps disgust. However, a more recent metaanalysis based on a different methodological approach and more studies, concludes that "the key elements of basic emotion views are reflected in neural correlates identified by neuroimaging studies." (Vytal & Hamann, 2010: 2864).

In spite of the above, it may still be argued that neural structures that are unique for specific emotions are not anatomically realistic (see Davidson, 2003). At the same time, this is not really what discrete emotion theories presume. Panksepp (1998), e.g., has argued that there are neural circuits of some complexity, which together form the neutral substrate of specific emotions. A more recent study (Kassam, Markey, Cherkassky, Loewenstein, & Just, 2013) suggests that a distributed pattern of neural activity reflects better how a neural emotion substrate should work. They used a machine learning approach to process functional magnetic resonance imaging date and were able to reliably predict emotional states from the data recorded during emotion elicitation. Being able to predict emotion categories from neural activation data is highly congruent with categorical theories. The authors note, however, that the factors found to underlie neural activations include valence and arousal (but not approach/avoidance). To the degree that an underlying dimensional structure was found to underpin the categories their data are also not incompatible with constructivist approaches to emotion. The authors propose a middle-ground view in that they found reliable neural patterns for specific emotions, which in turn were underpinned by the factors of valence, arousal, sociality, and lust.

A consideration of the evidence for and against categorical accounts of emotion suggests that supporting evidence is compelling but far from perfect. As evidence in support of dimensional theories consists largely of negative evidence for discrete theories (Barrett, 2006a) this leaves ample room for support of dimensional theories. At this point, a middle ground view as suggested by Kassam et al. (2013) based on data that supports a position based on both categories and dimension seems the most adequate summary.

5.3 EMOTION PERCEPTION

In this section, I will address what we currently know regarding the perceptions of emotional behavior. This discussion is complicated by the fact that, as noted above, emotion theorists have typically conflated the question of whether emotions are categorical "in essence" and whether emotions are perceived categorically by using the perceptual results to support or contradict notions regarding arguments about what emotions "actually are."

Specifically, discrete emotion theories assume specific (facial) expressions for specific emotions, which are inherent to the emotion (Ekman, 1972, 1984; Izard, 2007). This leads to three assumptions: (1) emotion expressions are present without learning, (2) emotion expressions are universal, a notion which is in fact based on Darwin's (1872/1965) assumption that (3) human emotion expressions are evolutionary adaptions on a continuum from animal emotions.

Evidence from comparative research does in fact suggest an overlap between the expressions of human and nonhuman primates (e.g., Chevalier-Skolnikoff, 1973; Parr, Waller, & Vick, 2007; Redican, 1982). Findings that chimpanzees react differentially to different human expressions (Itakura, 1994) as well as that human children's ability to interpret monkey vocalizations of aggression, fear, dominance, positive emotions, and submission develops simultaneously with their ability to interpret human emotional behavior (Linnankoski, Laasko, & Leinonen, 1994) also suggest similarities between the expressions of human and nonhuman primates. However, the interpretation of these findings is complicated in that it is often difficult to ensure that expressions actually serve as homologues across species or to ascertain emotional states in animals.

Research in infant facial expressions also suggests a genetic basis for some facial expressive displays. In a now classic study Eibl-Eibesfeldt (1973) reports that deaf and blind children show expressions of anger, happiness, and other emotions in appropriate situations

even though they could not have learned them through observation (see also Hwang & Matsumoto, 2016). Young infants also respond differently to different emotion expressions suggesting an ability to discriminate emotion expressions (see Izard et al., 1995). However, the correspondence between the expressions considered prototypical for various emotions and infants' expressions is often rather low (e.g., Camras, 1992; Camras, Malatesta, & Izard, 1991). More compelling are studies that show that congenitally blind athletes show the same pride expressions when winning as do sighted athletes (e.g., Tracy & Matsumoto, 2008; for a review see Hwang & Matsumoto, 2016).

However, as noted above, most of the evidence with regard to the question of whether there are or are not basic emotions and whether these are natural kinds stems from research on whether the perception of expressions is universal. That is, whether people from all cultures recognize specific expressions as signaling a specific emotion. The assumption of universality is a derivative of the assumption that facial expressions are evolutionarily developed and (within limits) hard-wired. The idea being that if humans share expressive signals with non-human animals then these signals should also be shared between humans. This assumption was already spelled out by Darwin (1872/1965), who sent out questionnaires to missionaries and ambassadors across the British Empire to inquire about the local populations' emotional expressions in response to certain stimuli and concluded that emotion expressions are indeed universal.

However, a number of studies in the early years of the 20th century came to the conclusion that emotions can only be recognized at chance levels even though other studies found good recognition rates. This disparity in findings led to the conclusion that, if anything, emotional facial expressions are culturally learned (Bruner & Tagiuri, 1954). This view remained basically unchanged until 1972 when Ekman, Friesen, and Ellsworth wrote a book to explicitly vindicate Darwin's idea that emotional expressions are universal and directly associated with an underlying emotional state. This book and related research by Ekman and colleagues as well as Izard (Izard, 1971a, 1971b) made research on the universal recognition of emotions the standard test for evolutionary based discrete emotion theories.

Various studies and overviews concluded that at least the so-called basic emotions are indeed cross-culturally recognized above chance (e.g., Biehl et al., 1997; Ekman, 1972; Ekman et al., 1987; Elfenbein & Ambady, 2002; Hwang & Matsumoto, 2016; Izard, 1971a). Basically these studies assess whether specific configurations of the human face (or voice) are given the same emotion labels by individuals from cultures that have had no contact with one another. However, there are several critiques of this body of research to keep in mind. The first

relates to the way that recognition was measured by the various investigators. In many instances a forced choice method, where participants see a face and have to select one (and only one) label from a predetermined list, was used. This means that participants were artificially constrained in their choices (for a discussion see Ekman, 1994; Izard, 1997; Russell, 1991, 1994, 1995). This design can therefore result in spurious high agreement across perceivers by a process of elimination. Thus, e.g., in one study children who saw a novel nonsense facial expression "recognized" this expression as "pax" or "tolen" because they paired the unknown expression with the unknown word through a process of elimination (Nelson & Russell, 2016). Even though this requires that the children could pair at least some of the expressions with some of the available labels prior to the experiment, the study illustrates the potential pitfalls of the forced-choice approach.

Yet another issue is whether people actually use emotion labels in everyday interaction. Frijda (1953) emphasized that people tend to generate in a free labeling task labels that are consistent with the social function or the action tendency of the emotion, such as "she wants to hit someone" or "he wants to hide."

In a second point of critique, social constructivist approaches to emotion emphasize differences in emotion vocabularies across cultures and subcultures. These linguistic differences preclude, in their view, sufficient comparability of the categories used by individuals from different cultural groups (Lutz & White, 1986; Wierzbicka, 1994).

A third issue is whether the results of labeling studies are due to cross cultural learning. Specifically, most studies on cross-cultural emotion recognition studied members of Western cultures or of cultures that have been exposed to Western medias. As such, it remains possible that participants reported what they had learned about the expressions. Hence, a number of studies were conducted that focused on preliterate tribes who had very limited exposure to Western culture (e.g., Ekman, Sorenson, & Friesen, 1969; Gendron, Roberson, van der Vyver, & Barrett, 2014b; Naab & Russell, 2007; Sauter, Eisner, Ekman, & Scott, 2010). Unfortunately these studies do not come to the same conclusions even when the studies were conducted with the same group (Gendron, Roberson, van der Vyver, & Barrett, 2014a; Sauter et al., 2010) albeit not necessarily within temporal proximity to one another (Ekman et al., 1969; Naab & Russell, 2007).

A lively discussion (Gendron, Roberson, & Barrett, 2015; Sauter, Eisner, Ekman, & Scott, 2015) ensued to explain the divergent finding by Sauter et al. (2010) and Gendron et al. (2014a, b). Both studied cross-cultural recognition of vocal emotion expression by Himba and Western decoders. Whereas Sauter et al. found such recognition Gendron et al. did not. Their discussion focused on methodological issues.

In this area of inquiry the methodological choices are difficult and fraught with disadvantages. Participants are not used to participating in experiments, making it imperative that the task is simple. When using a forced choice task across cultures, the exact choice of words is problematic because of uncertainties in translations. Sauter et al. (2010) therefore matched vocalizations to stories, such that participants were first told the story, then heard two vocalizations and had to decide which of the two matched the story. This is an easy task and eliminates the possibility that single words may drive the effect. However, results can depend on the nature of the foils, even though in this specific case additional analyses (Sauter et al., 2015) made this less likely.

Gendron et al. (2014a, b) used a similar story based approach as well as free labeling. For the free labeling task, labels provided by the Himba were translated by one translator who worked with the experimenters and were then coded by English language coders. Given the lack of experienced coders who spoke the participants' language this is the only solution, but the coding of translated verbal material by individuals unfamiliar with the original language is in itself fraught with problems. In addition, Sauter et al. (2015) note that Gendron et al.'s (2014a, b) story based approach suffered from the fact that story understanding was not verified. Another issue regards the stimulus material itself. Sauter et al. (2010) created nonsense vocalizations that were produced by native speakers from both groups. Gendron et al. (2014a, b) used similar vocalizations produced only by English speakers. Given a strict interpretation of discrete emotion theory this should not matter. However, as shown below, who produces an expression is known to be relevant. The divergent findings from these two groups of researchers and the discussion surrounding their findings again points to the importance of differences in both methodological approaches and levels of analysis.

As noted above, cross-cultural emotion recognition research is highly suggestive of the notion that discrete emotions are recognized cross-culturally. Yet, even the strongest evidence for consensual recognition never finds 100 percent agreement. The question is whether the difference is simply noise or whether there is cultural variance hidden in this noise. This was the conclusion drawn by Elfenbein and Ambady (2002) who found an ingroup advantage for emotion recognition, which can be best explained by the notion that there are indeed cultural dialects which lead to subtle variations in expressions and their recognition across cultures (Elfenbein, Beaupré, Levesque, & Hess, 2007). Findings such as these point to an intermediate position (Fiske, Kitayama, Markus, & Nisbett, 1998) acknowledging both universals and cultural variations in the expression and labeling of emotions, but the issue is as yet far from settled.

The study of cross-cultural emotion recognition is only an indirect way to assess emotion perception. More direct would be the assessment of the perceptual process as such. This has been done (Etcoff & Magee, 1992; Jack, Garrod, Yu, Caldara, & Schyns, 2012; Jack, Sun, Delis, Garrod, & Schyns, 2016) in a number of ways. Etcoff and Magee (1992) used a classic categorical perception task and concluded that the data most clearly support the notion that the facial expressions associated with a limited set of "basic" emotions are perceived categorically, but concede that they can not exclude an underlying dimensionality. Jack et al. (2012) found, using a reverse correlation task, that the mental images that East Asian and Western Caucasian participants hold of basic emotions do not match. They conclude, therefore, that emotions are not universal because they are not universally categorized in the same manner (using a different methodological approach a more recent study revealed four universal emotions; Jack et al., 2016). This conclusion assumes, as the authors note, that the facial movements perceived by observers reflect those produced in their social environment because they are signals designed for communication.

This last argument is at the crux of this line of research. It assumes that perceiving emotion expressions as categorical means that the underlying emotions must be as well. As we know from color perception, however, it is perfectly possible to perceive categories (unique colors) from a strictly dimensional input (wavelengths). One can also—within limits—communicate meaningfully about these categories. In this vein falls research by Martinez and colleagues (e.g., Martinez & Du, 2012; Neth & Martinez, 2009). They found that the configural facial changes that lead human observers to categorize a face, e.g., as angry versus sad vary in fact along a continuum. Yet, the human observers make a categorical choice and a machine-learning algorithm can predict this categorical choice as well.

Yet, independent of whether emotions or their expressions are categorical or dimensions, it can be argued that what counts from a functional perspective is whether people when faced with emotion expressions spontaneously categorize these or not—independent of whether emotions properly form categories.

Specifically, as is amply demonstrated by the use of facial expressions in the arts, films, and literature, people understand emotional facial expressions to express emotions and they react as a function of this understanding (cf. Niedenthal & Brauer, 2012). That is, people treat emotion expressions as if they express emotions and act in accordance (Hess & Hareli, in press).

This line of reasoning is based on the notion, that discrete emotion categories are socially functional. In fact, Darwin (1872/1965) considered the communicative value of emotion expression to be one of its

major evolutionary advantages. As Izard (2007) notes, emotion categories serve as a means "to collect a set of components and characteristics into a useful bundle" (p. 267). That is, the categories allow people to communicate their emotions and to thereby enrich their emotion knowledge (see Rimé, 2009). Emotion categories also "tell a story" about an emotion, as reflected in Lazarus' (1991) core relational themes. These themes capture the main information transmitted by the emotion. For example, sadness reflects the realization of an unrecoverable loss. These themes or stories in turn allow others to make deductions about the expresser's likely personality and values by reverse engineering the appraisals that underlie the emotions (Hareli & Hess, 2010; Hess & Hareli, 2015).

In fact, the ability to correctly apply emotion categories has been found to predict job performance for professional groups for whom interpersonal interaction is key, including counselors, physicians, teachers, human service workers, and managers (Elfenbein, Foo, White, Tan, & Aik, 2007). In a recent study, Hess, Kafetsios, Mauersberger, Blaison, and Kessler (in press) found that across two cultures (Germany and Greece) and using different expressive stimuli, the ability to correctly categorize emotions correlated positively with self-reports of interaction satisfaction in a diary study. This line of research underscores the usefulness of categorizing emotion relevant behavior.

5.4 CONCLUSION

In the discussion of the categorical nature of emotions, the question of universality has loomed large ever since Darwin (1872/1965) posited an evolutionary base for human emotion expressions and expression universality became a cornerstone for the assumption of discrete emotions. My (selective) overview of the relevant literature suggests a stance that acknowledges both universality of how we categorize emotion-related behavior and cultural variation in that categorization process.

This has obvious practical implications. Emotional dialects suggest that even if emotion expressions are universally recognized at very reasonable levels of accuracy, cultural differences entrain a risk for misunderstanding. Culture can also bias the very process of perceiving emotions (Hareli, Kafetsios, & Hess, 2015; Jack, Blais, Caldara, Scheepers, & Caldara, 2008; Masuda et al., 2008). Hence, even simple rules that in Western cultures are known to everyone—such that the twinkle in the eye means that the person we see is truly happy—may not apply elsewhere (Thibault, Levesque, Gosselin, & Hess, 2012). However, these are reasons for caution—not reasons to abandon the notion of emotion universality.

Overall, the answer to the question of whether emotions are categorical depends to some degree on why this question is asked and on the level of analysis. While evidence that emotions as perceived are discrete is convincing, it is clear that for some levels of analysis and specific questions, dimensional views seem more applicable. It is also not clear that people always categorize emotions. As Frijda (1953) noted, this may also not always be functional. However, in general being able to use discrete emotion labels is functional (Izard, 2007) as it informs us about our interaction partners (Hess & Hareli, 2015) and helps us navigate our social environment (Niedenthal & Brauer, 2012).

Acknowledgments

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